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The Editor Says:

"HAVING passed the Santa Claus age, we do not expect to see—under present conditions—an ambitious program of fundamental research financed and initiated by the textile industry during the next year. But here is the way we feel about it: If the type of cooperation now being developed among the U. S. Institute for Textile Research, the Textile Foundation, and other organizations—as reflected at the annual meeting of the Institute—is allowed to peter out without eventual results, then the industry just doesn't deserve a research movement. The preliminary organization job has been done; it is now up to individual manufacturers to support and push the work."

TEXTILE WORLD
December, 1932

TEXTILE RESEARCH

EDITORIAL

If Technocracy Makes Us Think

TECHNOCRACY'S PREDICTIONS of the social chaos that is to be the result of uncontrolled machine production are founded upon data which, in large part, have been proved by unquestioned authorities to be incorrect or unreliable. Its textile data, for example, is ridiculously false. Yet there is no denying the fact that by grossly exaggerating the growth of the machine, and by inventing a new and generally unintelligible vocabulary to obscure their statements, they have succeeded in dramatizing what has heretofore been known simply as "technological unemployment," and in gaining for their outpourings an exceptional volume of publicity, of which this is a sample.

Technocracy reminds us of a certain mathematical genius who is as unconcerned about the reliability of his basic data as are they, and who is always surprised that the results of his delving in the higher mathematics should be rejected as worthless by men who admit ignorance of the quantum theory, but who are able to shoot his basic data full of holes.

We know that Technocracy's data regarding the strength and wearing quality of ramie, and about the New Jersey rayon mill that will run twenty-four hours a day without attendance, are false. We know, too, that textile machinery and the steam engine were the causes of greater increases in industrial productivity during the first industrial revolution, than has been caused by all of the recent improvements in textile and power machinery. (See "Technocracy of 1835 Answered" in this issue.)

We know that since the close of the first industrial revolution several periods of great industrial and general prosperity have been enjoyed, notwithstanding a more or less steady improvement in labor-saving machinery, processes and management. With a marked increase in scientific and economic knowledge, and an adequate incentive to still greater increase, we may be confident that future periods of prosperity will be enjoyed.

If Technocracy were the group of super-scientists and super-economists that their writings assume them to be, they would not have made the error of assuming that an era of machine perfection was at hand, but, rather, would have emphasized the fact that the unfathomed depths of scientific and economic ignorance are so great that there is almost no limit to the possibilities of future industrial and social progress. So uniformly inaccurate, false or distorted are the data upon which their theorizing is based that it is apparent that they do not know how little they know about what can be done, to paraphrase an idea expressed by Alfred P. Sloan, Jr.

Like our mathematical "bug" they were so eager to give play to their deductive hobby that they neglected the essential basis of sound deductive reasoning. But, notwithstanding the fact that their deductions are nullified by the fallacious data upon which they are based, it is not impossible that the wide publicity given to Technocracy's theorizing may be productive of more thinking upon these subjects than could have been aroused by a less dramatic presentation of accurate data and of the deductions that the latter might justify. Certainly there is need of more intelligent and more general thinking upon the subjects advanced by Technocracy. Should it be thus stimulated resultfully then criticism of Technocracy may become congratulation.

New Device for Determining Wool Fineness

By J. I. HARDY, Ph.D.

Dr. Hardy is senior animal fibre technologist of the Bureau of Animal Industry, U. S. Department of Agriculture, and is the author of the chapter on "Wool Fibre Research" in U. S. Institute's book Textile Research: A Survey of Progress. The novel device which he invented and is here described, was developed for wool, but seems equally well adapted to similar measurement of groups of other fibres.

Introduction

RAPID DETERMINATION of wool fineness is usually done by the eye both by the producer and manufacturer. In the sorting of wool, fineness is judged largely by the eye. Ordinary laboratory methods would be far too slow to be practical for this work. In the research work of the Bureau of Animal Industry where hundreds of fleeces are judged each year on the sheep, eye judgments for fineness are used. In order to maintain uniformity in this judging of fineness from year to year it is carried on by three judges working independently. The average judgment of these three judges is used in the sheep breeding work of the Bureau.

It is a fact recognized by those working with wool that some samples appear different to the eye than they actually measure. It is because certain fibres in the samples stand out more prominently than others because of their crimp or distribution of fine and coarse fibres. Either of these conditions makes the entire sample misleading so far as the actual fineness is concerned. In the case of a wide range of fibre-fineness distribution within a particular grade the judgments for fineness given by different judges may be lacking in agreement. This is because one judge may pay more attention to the coarse fibres and judge the wool of

a lower grade of fineness than another judge, or vice versa. The occasional misjudging of a fleece is not a serious matter where thousands of fleeces are concerned.

However, a more accurate method is often desirable for the sheep breeders and others handling wool when much depends on one sample. This method must also be relatively quick and easy to operate.

A survey of the literature revealed no method which seemed adequate to meet these requirements. Failing to find such a method the writer has undertaken to develop one which he believes will be of practical value for this purpose.

The New Method and Apparatus

This method, illustrated in the sketch, consists in placing a small strand of cleaned and dried wool into a metal slot of a definite size in a piece of brass ⅛ inch thick. Any fibres of the strand failing to crowd into the slot are cut away by a specially arranged razor blade, and the fibres that just fill the slot and remain uncut are removed and counted.

Details of the arrangement of this apparatus are shown in the accompanying Figures: 1, 2 and 3. The stand, in the top of which the fibre slot is located, has a heavy base to give it stability and is about six inches high, substantial and readily portable. The slot found to work most satisfactorily is similar in shape to a half of a cross section of the two-edged type of safety razor blade and slightly wider. The base of the slot tapers to a sharp angle.

The cutting slot, which is transverse to the fibre slot, must be a snug fit for the cutting blade which is of the two-edged safety type. The cutting device, or arm, which is removable, is shown in position for cutting in Fig. 1. In Fig. 3 the cutting blade is shown in the same position. The small stud in the left-hand hole of the blade allows the blade to be adjusted for depth of cut. The center button is really an eccentric, and serves to tilt the blade about the right-hand button as a fulcrum. A scale on the lower left-hand edge of the blade holder (Fig. 1) allows the operator to adjust a new blade to the correct angle. This ensures duplication of results when a new blade is inserted. The

blade holder is handled like an ordinary knife, and the shoulder, provided at the left-hand lower portion of the holder, forms a guide when in contact with the top of the fibre stand. Thus, the cutting edge of the blade is allowed to descend a strictly limited distance into the slot and can sever only a portion of the fibres contained therein. (See Fig. 2.) With these adjustments

Fig. 1.

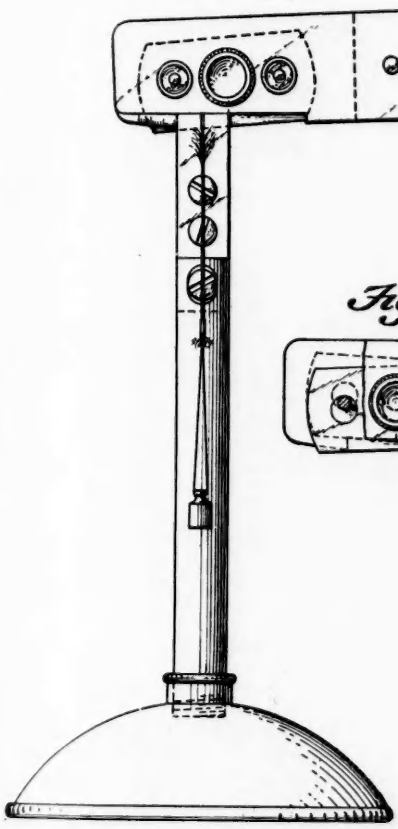


Fig. 2.

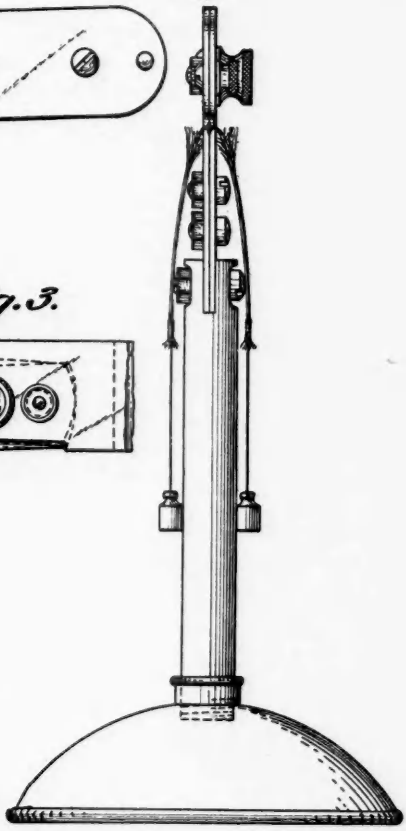
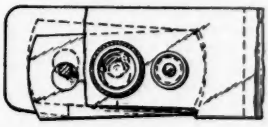


Fig. 3.



completed, the right- and left-hand thumb screws are tightened and the device is ready for the cutting operation. Only new or sharp razor blades should be used for cutting. Thorough cleaning of the wool avoids dulling of the cutting blade. Usually 100 cuttings can be made before it becomes necessary to change the blade.

Ten-gram balance weights are used as a means of obtaining tension upon the fibres while they are being cut. As shown in Fig. 2, one of these weights is attached to each end of a small strand of wool. This is done by means of string and ordinary adhesive tape. The strand of wool should be small enough so that it will be drawn to the bottom of the slot by the tension of the two weights.

Before making a series of fineness measurements the fibre slot should be standardized with a sample of known fineness. The slot should be checked with such a sample after at least every 50 cuttings. For the tests herein reported the razor blade was so adjusted as to leave 25 fibres of 36s wool top in the slot. Some of the coarser types of rayon work very satisfactorily for the quick standardization of this slot.

Results of Wool Top Test

Many samples of wool have been tested from sheep of known breeding as well as samples of commercial greasy wool, all of which had been previously graded for fineness by an experienced grader. The practical possibilities of this method are best shown by giving the results obtained upon wool tops ranging in fineness from 36s to 80s.

TABLE 1.

Number of wool fibres of 12 different grades of wool top,* ranging in fineness from 36s to 80s, that filled the slot in five different tests.

Slot test No.	36s	40s	44s	46s	48s	50s	56s	58s	60s	64s	70s	80s
1	27	27	31	36	35	35	48	57	61	64	74	86
2	27	27	26	31	40	38	45	53	66	59	78	80
3	24	32	29	33	41	48	46	53	63	63	79	87
4	26	28	36	32	35	43	41	54	59	66	70	88
5	23	29	34	35	41	43	43	54	58	70	72	78
Average	25.4	28.6	31.2	33.4	38.4	41.4	44.6	54.2	61.4	64.4	74.6	83.8

* These grades of wool top corresponded in fineness to the United States Offical Standards for wool top.

The slot test for fineness, in the case of wool top, is very satisfactory inasmuch as the fibres have been mixed by machinery and the fine and coarse fibres for each sample of a different fineness

are uniformly distributed. With wool as it comes from the sheep the method also works well, although, of course, the variation in fibre numbers will vary according to the uniformity of the samples tested. This method for fineness yields the average fineness in a quick and satisfactory manner and should prove of value to those who have use for such results, whether it be a breeder working with his sheep or a wool man who wants a quick test on a wool top.

A public service patent has been applied for upon this apparatus.

This description is the first published discussion of the subject except for a brief mention in the Official Report of the Chief of the Bureau of Animal Industry, 1932, and a mimeograph announcement included in a compilation distributed among specialists in Animal Husbandry. The device was developed and experimental work conducted in the laboratories of the United States Department of Agriculture, although some preliminary work on this device was conducted in 1931 in Europe while the writer was holding a National Research Fellowship in the Biological Sciences.

"I venture to say that if one-tenth of the money which has been lost in this depression had been put into a wisely planned program of research, the other nine-tenths would never have been lost."—Karl T. Compton, President, Massachusetts Institute of Technology.

Analysis of Weighted Silk*

By RALPH T. MEASE

A GENERALLY applicable, rapid, and convenient method for the determination of the amount of pure silk fibre in silk textiles is described. Weighting and finishing materials are removed by repeated extractions with hot water, 2 per cent sodium carbonate solution and a solution containing 2 per cent of hydrochloric and 2 per cent of hydrofluoric acids. Results of analyses of samples of known composition are presented which indicate that the results are correct to within 1 per cent of the weight of the dried finished material. Results obtained by inexperienced analysts working in different laboratories have been in good agreement when samples of the same silk were analyzed. Qualitative methods for the identification of the following weighting materials are given: Aluminum, lead, phosphate, silica, tin, zinc.

Introduction

RAW SILK, as it comes to the manufacturer, contains about 75 per cent fibre (fibroin) and about 25 per cent gum (sericin) exclusive of moisture. At some stage of the processing the gum is removed by "boiling off" in a soap solution. The silk may then be "weighted" by the addition of various metallic salts or other substances, the amount of the weighting being determined by the purposes for which the silk is intended, the selling price, and similar considerations. The amount of weighting added seldom is less than the amount of the gum removed

* Research Paper No. 498. Reprinted from Bureau of Standards Journal of Research, Vol. 9, Nov., 1932.

and it may exceed the amount of the silk fibroin. The claim is made that weighted silk has a better "hand" or "feel" than unweighted silk, that it drapes better, and that its lower cost makes possible the use of silk by persons who otherwise could not afford it.

After weighting, the silk may be dyed, or printed. It is finally "finished" by the addition of gums, soaps, waxes, hygroscopic substances, or other "finishing" materials which contribute to the desired properties.

The need for a standard method of analysis for weighted silk arose several years ago when special attention was being given to the problem of overweighting. There was an insistent demand from numerous manufacturers, distributors, and consumers for definite limits on the amount of weighting to be allowed on different types of silk fabrics. This led to the tentative designation of limits by the Silk Association of America in January, 1929.[1] In order to insure satisfactory analyses of weighted silks for conformance with these standards or other standards that might be agreed upon, attention was given by a Technical Committee on Weighted Silk [2] to methods of analysis. A proposed standard method was published.[3]

The proposed standard method was the one in common use calling for extraction with hydrofluoric acid, amplified to make possible the successful analysis of silks weighted with materials other than tin-phosphate-silicate. When samples of silk of known weighting content were submitted to cooperating laboratories for analysis by this method, the results were in error in one instance by no less than 32 per cent of the amount actually present and in two other instances by 17 and 20 per cent.[4]

In anticipation of the need for analyses of weighted silks in several projects in the textile section of the Bureau of Standards, and with the expectation that the Federal Trade Commission would require analyses of weighted silks, some attention was given to the development of a generally applicable and satisfactory method. This work resulted in a method which is reasonably rapid, convenient, and reliable. The work is described and the resulting method is given in this paper. Qualitative tests that have been found useful in identifying inorganic weighting materials on silk are also given.

Experimental Studies

The important determination in the analysis of weighted silk is that of fibroin content. Several methods have been proposed for obtaining this value. In one method [5] the fibroin is evaluated by determining nitrogen, which is a constituent of silk fibroin. This value is in error if dyestuffs containing nitrogen are present in the silk. In another method [6] the fibroin content is indirectly evaluated by making a determination of the ash content of the weighted silk. This is done by igniting a sample in air. The weighting materials are changed during the ignition and the weight of the ash is not a true measure of the weighting materials contained in the material. A third method, which is also indirect, consists in the extraction of inorganic materials with hydrofluoric acid.[7] When lead, zinc, or aluminum salts are present, however, the material is alternately treated with hydrofluoric and hydrochloric acids. Neither of these last two treatments entirely removes the inorganic materials.

It was found in this laboratory that a solution containing 2 per cent of hydrofluoric and 2 per cent of hydrochloric acids was more effective in removing inorganic weighting materials than either acid alone, or the alternate treatments with these two acids. Furthermore, the combination of hydrofluoric and hydrochloric acids was found to be less destructive to silk fibroin than hydrochloric acid alone.

Unweighted silk cloth was purified by boiling it in several changes of neutral soap solution, then extracting with alcohol to remove soap, and finally with ether. It was then immersed in boiling water and finally dried in air at room temperature. This silk is referred to as "silk fibroin" in the experiments to be described.

The first step in the analysis of weighted silk by extraction with hydrofluoric acid is the removal of soluble finishing materials; that is, materials soluble in water or organic solvents that might be expected to be removed by either wet washing or dry cleaning. The purpose is not only to obtain a value for the amount of such materials, but to expose the insoluble weighting to more ready attack in subsequent treatments. Rinsing of the specimen with alcohol and ether to complete the removal of

soluble finishing materials and to expedite the drying was found to be unsatisfactory because silk fibroin may hold these solvents even when dried above their boiling points. This was demonstrated in the following experiments:

Samples of silk fibroin weighting about 2.5 g each were dried to constant weight (± 0.1 per cent) in an air oven at 105° to 110° C. The time required was 1 to 1½ hours. Weighings were made at one-half hour intervals up to five hours. These samples were then soaked in 100 times their weight of distilled water at 65° C. for 20 minutes, rinsed in a fresh portion of distilled water, then in alcohol and finally in ether, a procedure typical of those used for soluble finishing materials. They were then dried to constant weight as before. The dry weight of the samples thus treated was approximately 1.5 per cent more than the weight of the original dry material. The samples were then immersed in boiling water and again dried. After this treatment the samples were found to have returned to their original weight. This procedure was repeated and it was clearly evident that when the silk was rinsed in alcohol and then in ether before drying, the weight of the dry material was considerably higher than when the silk was rinsed finally in boiling water. It was also found by other experiments that the alcohol and ether could be removed by water at temperatures below boiling. On this evidence, the final rinse in alcohol and ether must be followed by immersion of the specimens in water before drying.

After removal of soluble finishing materials, weighting is removed in the hydrofluoric acid method by alternate treatments of the silk with dilute hydrofluoric acid and dilute sodium carbonate solutions. Various concentrations, temperatures, and times of treatment are used in different laboratories. According to the method recommended by the Technical Committee on Weighted Silk, silk weighted with tin phosphate without silicate requires a treatment with dilute hydrochloric acid solution as well as with hydrofluoric acid.

Preliminary experiments indicated that both the concentration and temperature of the reagents are extremely important, too drastic treatment materially affecting the silk fibron and too mild treatment not removing the weighting completely. Further, a mixture of hydrofluoric and hydrochloric acids [8] was

found to be more efficient and less harmful than the separate treatments with hydrochloric and hydrofluoric acids called for in the method of the technical committee.

The treatments which were finally adopted will be described in detail. The effects of these treatments on silk weighted in

TABLE 1

Results of analyses of weighted silks

[Values are in percentages of the weight of the ovendried specimen. Results of duplicate analyses given]

Sample No.	Type of weighting	Extraction with apparatus of Figure 1				Extraction with apparatus of Figure 3		
		Silk content	Soluble finishing materials	Residual ash	Silk fibroin	Soluble finishing materials	Residual ash	Silk fibroin
0	Tin phosphate...	60.4	4.3 4.5	1.2	61.0 60.8	.....	.....	.....
1	Tin phosphate silicate.....	48.3	4.5 3.7	.0	48.6 49.1	3.4 4.2	0.5	50.2 49.2
2	Tin phosphate, lead, silicate...	50.8	4.5 5.1	.8	50.9 50.8	4.7 4.6	.1	52.8 52.6
3	Tin phosphate logwood black.	52.1	4.9 5.2	.1	53.0 53.0	2.7 3.4	.1	55.0 54.3
4	Tin phosphate silicate.....	50.1	4.7 4.7	.1	50.5 49.9	.....	.....	.....
5	Tin phosphate zinc.....	60.9	5.2 5.3	.0	60.6 60.8	.....	.....	.....
10	Commercial silk, tin phosphate silicate.....	Unknown.	4.8 4.9	.0	48.4 48.0	4.2 3.9	.0	48.1 48.4
11	....do.....	Unknown.	6.3 6.0	.0	50.2 51.0	5.8 5.7	.0	50.9 51.1
12	....do.....	Unknown.	5.2 6.6	.0	60.0 59.2	4.6 5.2	.0	59.0 59.0
13	....do.....	Unknown.	6.8 6.5	.0	92.5 92.3	3.4 4.9	.0	93.5 93.1
14	....do.....	Unknown.	5.5 5.4	.1	49.1 49.4	4.7 5.2	.1	48.3 48.6
15	....do.....	Unknown.	5.5 5.2	.0	42.2 42.3	5.3 4.6	.0	41.6 41.2
16	....do.....	Unknown.	5.4 5.2	.0	50.5 50.0	4.8 5.9	.1	49.6 49.3
17	....do.....	Unknown.	6.8 6.4	.0	55.2 55.2	5.0 5.6	.1	54.9 55.2

several different ways likely to be encountered in practice[9] are shown in Table 1. The amount of silk fibroin found by analysis of silk of known weighting content agreed with the amount present within 1 per cent of the weight of the dry finished silk for tin phosphate, logwood black, and other types of weighting as well as for the usual tin-phosphate-silicate weighted silk. The average loss in weight of eight samples of silk fibroin, when given the treatment for removing weighting, was 0.49 per cent and the maximum loss was less than 1 per cent.

Analyses of over 75 samples of commercial weighted silks have been made according to the method by several analysts, with excellent results. The amount of dry silk fibroin obtained in duplicate determinations agrees well within 1 per cent of the weight of the dried sample. The ash obtained by igniting the sample after treatment for removal of weighting seldom exceeds 0.1 per cent and is usually very much less than this when the silk is weighted with tin-phosphate-silicate.

Results of a few analyses of commercial samples made independently by analysts of two laboratories using different kind of equipment are given in Table 2.[10] Evidently good results may be obtained without the use of special equipment.

TABLE 2

Results of analyses by two independent laboratories on commercial silks

[Values are for silk fibroin expressed as percentages of the weight of the ovendried specimen]

Sample No.	By Bureau of Standards extraction with apparatus of Figure 3	By Pennsylvania State College laboratory inexperienced analyst with no special equipment	Sample No.	By Bureau of Standards extraction with apparatus of Figure 3	By Pennsylvania State College laboratory inexperienced analyst with no special equipment
41...	98.8	99.3	51...	97.2	98.3
42...	91.5	91.8	52...	91.8	92.0
43...	62.0	61.6	53...	65.4	67.2
44...	57.7	58.3	54...	58.2	58.9
45...	49.4	48.7	55...	54.8	55.6
46...	49.3	48.3	56...	49.4	50.8
47...	47.5	46.8	57...	48.5	50.0
48...	43.8	43.3	58...	41.4	42.9

A Method for Analysis of Weighted Silk

The specimen for analysis should be representative of the cloth. A strip the full width of the cloth is suggested and should weigh from 3 to 5 g.

The specimen is dried at 105° to 110° C. to constant weight (± 0.1 per cent). If the specimen is loosely spread on a watch glass and placed in the usual laboratory electric oven at 105° to 110° C., it should dry within one and one-half hours. It is then placed in a tared weighing bottle, allowed to cool in a desiccator, and weighed. The weight of the dry specimen is called weight A.

Soluble finishing materials are removed by the following treatments. The specimen is immersed for about two minutes each in two 30 ml portions of diethyl ether at room temperature, squeezing by hand after each immersion. Then it is treated similarly with two 30 ml portions of ethyl alcohol at 50° to 60° C. Finally it is immersed in 90 to 100 times its weight of distilled water at 65° to 70° C. for 20 minutes, squeezed by hand, and rinsed by immersion for about one-half minute each in three fresh portions of distilled water at the same temperature, squeezing by hand after each immersion. It is then dried at 105° to 110° C as before. The weight of the dry specimen at this stage is called weight B.

Weight A — weight B × 100/weight A = soluble finishing materials in per cent (based on the weight of the dried specimen).

The more firmly held weighting and finishing materials are now removed by the following series of treatments: (*a*) The specimen is immersed for 20 minutes in 90 to 100 times its weight of a solution [11] containing 2 per cent of hydrofluoric acid and 2 per cent of hydrochloric acid maintained at a temperature of 55° C. ± 1° C. The acid liquid is decanted and the specimen is rinsed with two portions of distilled water at 55° to 60° C. squeezing by hand after each rinse. (*b*) The treatment with acid solution (fresh solution) followed by rinsing is repeated. (*c*) This treatment is again repeated using a 2 per cent solution of sodium carbonate in place of the acid solution. (*d* and *e*) The treatment with acid solution is then applied two times more. (*f*) The specimen is then rinsed several times with distilled

water and is dried as previously described. The dry weight is called weight C. Provided all materials other than silk fibroin have been removed (see suggestions for ashing the specimen below), then: Weight C $\times$ 100/weight A = silk fibroin in per cent (based on the weight of the dried specimen).

Weight A — weight C $\times$ 100/weight A = total weighting in per cent (based on the weight of the dried specimen).

The total weighting thus obtained includes all substances other than silk fibroin.

Weighting is adequately removed from some silks when steps (*b*) and (*e*) are omitted, but these steps are necessary for the complete removal of weighting from others. It is advisable to determine the ash as a check on the effectiveness of the extraction. Ashing is done preferably by heating the specimen in a well ventilated muffle furnace. If the weight of the ash is more than 0.2 per cent it should be subtracted from the value obtained for weight C in the formulas.

The simple oil bath shown in Figure 1 is a convenience if a number of analyses are to be made. With it the temperature of the solutions can readily be controlled to within 1° C. and eight specimens can be handled simultaneously.

When many samples are to be analyzed time may be saved by using a battery of semiautomatic extraction units. One of these units, constructed of thick walled Pyrex glass, is shown in Figure 2. The specimens to be extracted are placed loosely in the tube, *F*.

Apparatus of the dimensions indicated will hold five specimens. The liquid is placed in the 1-liter flask, heated to the proper temperature, and the flask is inverted in the position shown at *A*. The orifice, *D*, is of such size that 15 to 20 minutes are required for the flask to empty. The extraction is not always quite so thorough with this apparatus as when the specimens are treated individually in beakers in the constant temperature bath.

Concentrated hydrofluoric acid may be measured with a pipette like that shown in Figure 3. Such a pipette may be made of Pyrex glass and coated on the inside by drawing melted ozokerite into the cold pipette and allowing the excess to drain. The acid is drawn into the pipette by means of a rubber tube attached at one end to *O* and at the other to the laboratory

vacuum. The acid may be diluted and handled in a Pyrex beaker also coated on the inside with ozokerite. If hydrofluoric acid comes in contact with the skin, it should be removed as soon

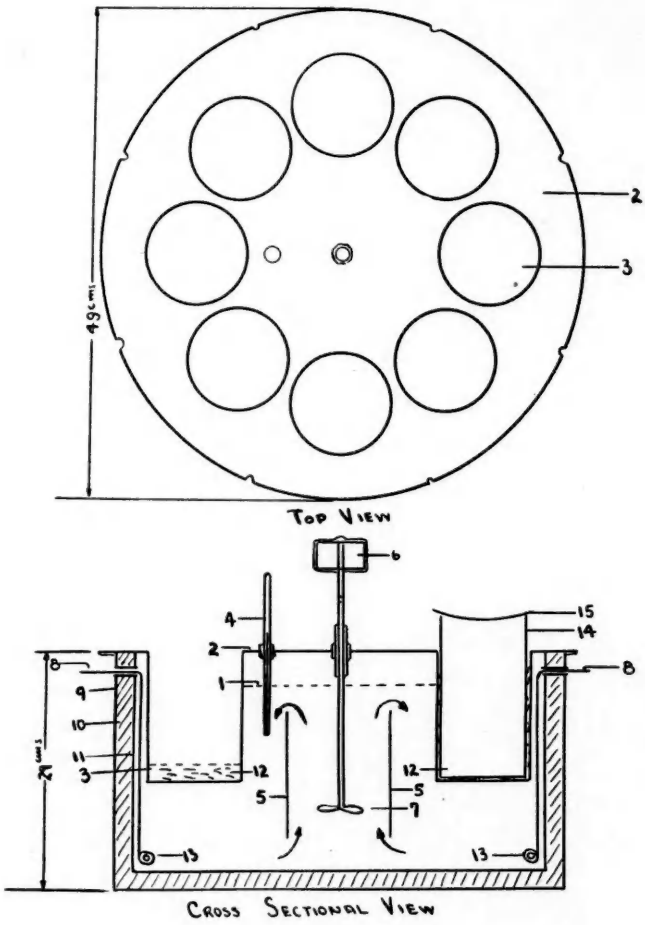


FIG. 1

Electrically heated oil bath for control of the temperature of the solutions during the extraction process.

1, level of oil in the bath; 2, metal cover; 3, body of water bath container; 4, thermometer; 5, wall of cylinder to guide the circulating oil; 6, electric motor; 7, propeller blade for agitating the oil bath; 8, glass insulated electric leads to heater coil; 9, outer wall of metal container; 10, mineral wool for heat insulation; 11, inner wall of double-jacketed metal container; 12, water bath; 13, nichrome wire heating coil—1 unit of a 3 and 1 of a 4 amp. current consumption at 110 v; 14,800 ml Pyrex beaker, tall form; and 15, watch glass cover.

as possible by washing with a solution of borax to prevent burns. Hydrofluoric acid burns should be treated by keeping the affected parts moist with a saturated solution of borax.

Qualitative Tests for Inorganic Weighting Materials

The qualitative tests briefly described below provide for the detection of aluminum, lead, phosphate, silicate, tin and zinc

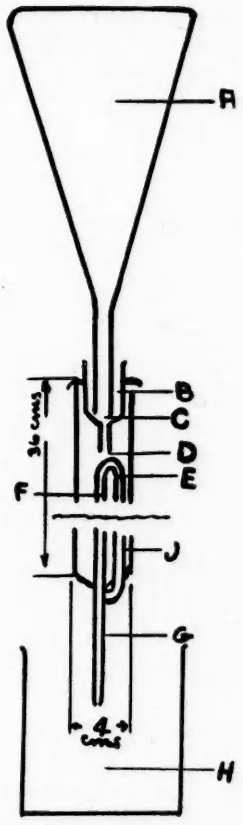


FIG. 2

A semiautomatic extraction apparatus for analysis of weighted silk.

A, 1,000 ml Erlenmeyer flask; *B*, trap; *C*, outlet for liquid and inlet for air to flask *A*; *D*, capillary tube controlling flow of liquid; *JEG*, siphon tube; *F*, chamber for samples; *H*, reservoir for spent liquor.

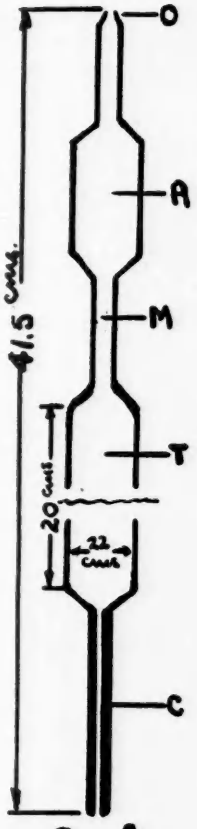


FIG. 3

A pipette for transferring and measuring concentrated hydrofluoric acid.

T, main reservoir; *R*, auxiliary reservoir; *M*, calibration mark; *O*, suction orifice; *C*, capillary discharge tube.

when any one or all are present. They are based upon those described in text-books [12] of chemical analysis and were chosen for reliability, convenience as to length of time required, and simplicity of manipulation. The tests are useful only for the detection of substances commonly used for weighting according to present practices. When small amounts of these substances are to be detected or additional or interfering ones are suspected of being present, the analyst should consult the references given in footnote 12.

Detection of inorganic materials in silk.—Inorganic weighting materials are conveniently detected by burning a small piece of the fabric. The ash will retain the form of the original threads if the material has been weighted with inorganic materials. A sample that is not thus weighted will curl back upon itself as it is burned and leave a soft black globular ash.

Identification of inorganic weighting materials—(*a*) *Preparation of the sample.*—A piece about 4 by 10 inches is thoroughly wet with a solution containing 90 g of anhydrous sodium carbonate and 90 g of anhydrous potassium carbonate, dissolved in 400 ml of water. It is suspended over a beaker containing 30 ml of dilute (approximately 10 per cent) hydrochloric acid solution and partially dried by brushing the flame of a hand torch or Bunsen burner across it. It is then ignited by directing the flame on the lower edge. The fused portions are allowed to drop into the acid in the beaker.

(*b*) *Silica.*—If silicates are present, a white flocculent precipitate is formed when the acid solution from (*a*) is boiled. The solution is decanted and filtered and the residue in the beaker digested with about 10 ml of warm concentrated hydrochloric acid for about 15 minutes; this acid is poured through the filter paper and added to the filtrate, which is boiled with 5 ml of concentrated nitric acid, cooled neutralized with sodium hydroxide (25 per cent solution) and enough hydrochloric acid added to produce a clear solution. The solution is used for tests (*c*) to (*g*) described below.

(*c*) *Lead.*—About 3 ml of the solution is neutralized with sodium hydroxide using phenolphthalein as an indicator. The solution is then made just acid with hydrochloric acid and about 1 ml of water saturated with hydrogen sulphide is added. If

lead is present, a gray to black coloration is produced. (A yellow precipitate indicates the presence of tin.) If the sample of silk to be tested is light in color, it may be tested directly for lead by moistening it with water and exposing it to a jet of hydrogen sulphide gas. A change to gray or black indicates the presence of lead.

(*d*) *Aluminum.*—To about 3 ml of the solution, ½ ml of a saturated solution of ammonium chloride, ½ ml of alizarin (prepared by dissolving 0.1 g of the dye, Colour Index No. 1034 in distilled water), and an excess of ammonium hydroxide are added. The mixture is heated to boiling, an excess of glacial acetic acid is added, and the mixture diluted. A red flocculent precipitate denotes the presence of aluminum.

(*e*) *Tin.*—About 2 ml of the solution is neutralized with 25 per cent sodium hydroxide and about five drops in excess added. The solution is filtered, the filtrate acidified with hydrochloric acid, and a few drops of a 1 per cent water solution of cupferron added. A white precipitate indicates the presence of tin.

(*f*) *Zinc.*—About 3 ml of the solution is neutralized with 25 per cent sodium hydroxide, enough hydrochloric acid and water are added to produce a clear solution, and about ½ ml of a 2 per cent solution of potassium ferrocyanide is then added. A white precipitate indicates the presence of zinc.

(*g*) *Phosphate.*—About 2 ml of the solution is neutralized with sodium hydroxide and the resulting solution is acidified with nitric acid. It is heated and then added to an equal volume of hot acid ammonium molybdate. A lemon yellow precipitate is formed on standing if phosphates are present.

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3. Anon, To find silk weighting content, *Textile World,* vol. 76, p. 1454, Sept. 14, 1929.

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8. Suggested informally several years ago by Dr. Victor Froelicher, chief chemist, *Textile Dyeing Co. of America.*

9. The author is indebted to Dr. Victor Froelicher for the samples of known weighting content representative of the different types of weighting.

10. These results were obtained under the supervision of Prof. Pauline Beery Mack, of the department of home economics, *Pennsylvania State College.*

11. This reagent may conveniently be prepared by mixing equal volumes of 4 per cent ($\pm$ 0.1 per cent) hydrofluoric and 4 per cent ($\pm$ 0.1 per cent) hydrochloric acids. High concentrations of mineral acids disintegrate silk. Too low a concentration may not remove inorganic materials sufficienly well from all types of weighted silk fabrics. For this work the concentration of each of the acids was determined by titration with a standard base. The concentrations given mean per cent by weight of actual HF and HCl (not of the ordinary concentrated acids). The reagent is approximately N with respect to HF and $N/2$ with respect to HCl.

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"Some people consider research a dull and sleepy affair. To me, research is full of dynamite. In the hands of a competitor it can strew your own business path with heartbreaking obstacles. Used by yourself, it can blast your way to success."—A. Lincoln Filene.

Foundation Research Explained

THE TEXTILE FOUNDATION is making available for general publication descriptions of the character and purpose of researches that it is financing, these being written by men engaged in these studies, and in sufficiently non-technical language to inform the general public of what is being done for their benefit through scientific textile research. The more technical portions of these stories should be equally informative to all textile men, and will be published as they become available.

Study of Silk Soaking

A. N. ROGERS, a Textile Foundation research fellow at Lehigh University, Bethlehem, Penna., who is working under Drs. E. R. Theis and H. M. Ullman, on the "Effect of Bacteria and Vegetable Oils on Silk," writes as follows regarding his work:

"It is very difficult, if not impossible, to spin threads from dry fibres. Cotton, silk, wool and many other natural fibres are harsh and brittle. Silk thread, for example, consists of individual fibres cemented together by sericin, a glue secreted by the silkworm during the spinning of the cocoon. This glue is extremely dry and brittle, and presents edges so sharp that the thread will cut grooves in the porcelain guides over which the thread passes during the processes of manufacture. In addition, any fabrics made from such thread would be seriously lacking in strength and pliability.

"In order to overcome this difficulty, manufacturers 'lubricate' the silk fibres before spinning. The silk is soaked for several hours in emulsions of oil contained in metal-lined wooden tubs. In order to cause the oil to mix with water and penetrate the silk, an emulsifying agent, such as soap, must be employed. Lately, experiments have been made with other emulsifiers such

as sulphonated oils. These treatments render the silk soft and pliable; and the finished product, after the oils have been removed, has a very high tensile strength.

"Much of the texture and strength of the finished product depends on the type of oil used and its manner of application. Each manufacturer uses a process which he considers superior to all others. This process he guards jealously. As a result, silks produced by different concerns from the same raw fibre may be entirely different; and even separate lots from the same mill may show wide variation.

"In order to eliminate guess work and rule-of-thumb methods in silk soaking, this research was undertaken. What are the characteristics of a good soaking oil? What type of emulsifying agent is best? Why do two seemingly identical soaking baths give different products? Does the acidity of the bath have any effect? In addition, soaking oil contains bacteria which attack the protein of which the silk is composed. What is the action of these bacteria and how may it be controlled? To these and similar questions we hope to find an answer. Uncertain methods must be replaced by carefully controlled processes."

Fluorescence and Polarized Light

"MAN has great use for cotton and other fibres because they possess desirable properties. Two of the most important of these properties are strength and ability to take on color, and the textile industry is quite interested in knowing all it can about these properties and how they are related to the structure of the fibre. The manner in which the molecules and micelles which make up a fibre are oriented, or lined up, has a good deal to do with these two properties, and on this point some very useful information may be obtained by a study of fluorescence, and of polarized light." So observes Dr. Donald R. Morey who, under the direction of Dr. Ernest L. Merritt at Cornell University, is giving full time attention to research on the general subject of the "Application of Polarized Light to Textile Research," as a research fellow of The Textile Foundation.

"The research is guided to some extent into definite channels; to make progress we cannot let our scientific curiosity carry us too far away. The Textile Foundation, for instance, asks me to be curious about the structure of fibres, such as cotton and wool fibres. But there the limitations stop, and I am free to wonder in my own way about the whys and hows of fibre structure without attempting to answer 'what use will you make of it?' When the questions 'why' and 'how' are answered, application will be close at hand, and perhaps in ways quite undreamed of now.

"Fluorescence is the term applied to the phenomenon of light being given off by a substance when it is placed in ultra violet light. A number of the dyes used on textiles—particularly the rhodamin family—are able to fluoresce. Molecules are not observed directly; the information we have about them is gained from a study of their effects, and of what they do. Since a fluorescent molecule will give off light when radiated, we can find out more about it than we could if it had done nothing when radiated. In many cases a molecule capable of fluorescing is a more useful scientific tool than a molecule unable to fluoresce.

"In the study of orientation of the fibre, fluorescent dyes are used to dye the fibre. When dye molecules are taken up by the fibre, it is because there are forces of attraction between the molecules of dye and fibre. (There is some debate among scientists whether or not to call these forces chemical.) However, if the fibre molecules lie in a random fashion, it is to be expected that the dye molecules will be held in a helter-skelter fashion, and if the fibre molecules are lined up, there should be an orientation or alignment of the dye molecules. At this point the ability of the dye molecules to fluoresce is extremely useful. If the dye molecules are scattered through the fibre at random, the fluorescent light will be unpolarized; if they are completely lined up, the fluorescent light will be completely polarized, and for any degree of alignment of the molecules there corresponds a certain amount of polarization of the fluorescent light.

"Since individual fibres are examined, it is of course necessary to use a microscope, with special attachments for the measurement of the percent polarization."

Test-Tube Route to Recovery*

By Dr. JULIUS KLEIN

WHEN I hear some of the alarmists of the present day bemoaning our rapid scientific and industrial progress, and suggesting, in effect, that it is time to declare a moratorium on all research and invention, I can not but think of certain primitive folk who give their children a start in life by clamping boards down on their heads. Some critics are proposing the altogether fantastic notion of strapping a board to the inventive head of the American people. I do not think we should take such proposals very seriously. It will take more than a group of well-meaning theorists to call a halt to the ceaseless quest of new things, that tireless zeal for new and better ways of producing things, that is so characteristic of our people.

Rather than strap boards on the heads of our inventors, society should offer them every sort of stimulus, for the road back to prosperity leads right through the test-tubes of America's research laboratories. And I am glad to say that never before in our history has there been the attention paid to research that there is today. Change is the key-note of our era—change for the better—and the directions of change are being quietly but very definitely controlled by the patient workers in the research laboratories of our industrial plants, private foundations and universities, and of the Federal Government. The significance of this was well described by President Hoover, when he wrote a few weeks ago:

"The social relations of mankind have already been altered by these changes beyond the utmost imagination of our forefathers. Further and more revolutionary changes will be wrought."

* Abstract of a radio talk by the Assistant Secretary of Commerce, delivered over the coast-to-coast network of the Columbia Broadcasting System, from Washington, D. C., Jan. 15, 1933.

Limits of Inventive Ingenuity Unpredictable

It would be a bold prophet indeed who would attempt to set a limit to man's inventive ingenuity or to predict the kind of world in which our grandchildren or even our children will be living! One of the greatest inventor-engineers in the automotive field, who certainly knows as much as any living man about the field he has chosen, recently declared that no one could conceive of what the automobile of 1950 would look like. Just compare the striking lines of the new 1933 cars with those of only two or three years ago. In spite of the high state of development of motor transportation today, its engineers have no illusions about having approached a limit of perfection. Persistent research is the keystone of that important industry.

And remember this vital truth: new industries have played important parts in pulling us out of past business depressions. In the troubled days of the early 'nineties the bicycle and the typewriter came to the rescue; after the panic of 1907 the influence of the automobile began to be increasingly and very helpfully felt; as an important "lift" out of the 1920–21 slump, there was the radio. None of these industries sprang full-grown into the picture as important factors in the economic situation. On the contrary, each was the fruit of long and patient research. There can be no question that in the laboratories of today there are being developed ideas that are going to be as important as were the inventions of the past in contributing to the general welfare.

Research Makes Invention Efficient

There was a time in the history of mankind when new products or processes were discovered, rather than invented. Men would stumble upon such discoveries, which probably surprised them as much as they did the rest of the world. But our scientists and technicians today are by no means groping about and hoping for some happy chance or sudden inspiration to reward their efforts. They set themselves very definite problems and they work along patiently until they have arrived at definite and satisfactory solutions. Research has made of invention a scientific, highly efficient process. The head of a chemical research

institution has stated that the manufacturer of today, whether he wishes to improve an old product or embark on a new venture, has merely to go to the chemist and describe to him the ideal material for his purpose. The chemist will produce it for him. It was not very long ago when such materials as bakelite, rayon, cellophane, had not even taken form in the minds of chemists.

Depression Stimulates Research

Necessity, as we learned from our copy-books, is the mother of invention. The stern pressure that has been bearing down upon American industry during the last few years has been an especially compelling urge to the exploration of hidden truths which might point the way toward better times. Such research in almost every field has resulted not only in the perfection of new products but in the improvement of old ones and in a reduction of production costs—always a powerful stimulant of buying among us consumers.

The brand-new air-conditioning industry is making unobtrusive but steady progress toward occupying a more important place in our scheme of living than may seem possible to those who have not studied the potentialities of this development. I should not be surprised if the school children of today grow up to tell their children of the backward era when they went to school, when neither their homes nor their schoolhouses had even such commonplace adjuncts to proper living as air conditioners.

We hear much these days of the unfortunate plight of the railroads. But do not make the mistake of concluding that this form of transportation is ever going to be a "back number." In the great research laboratories work is under way that may give us an idea of what the railroad train of tomorrow will be like. Already we have air-conditioned passenger cars. That is one development that has come to stay. But I venture to say that the railroad train of a few years hence will show greater advances in speed and comfort than anything that most of us have ever dreamed of. Speed, for instance, of 100 miles, or even 150 miles an hour, can be attained by changing the design of locomotives and cars to reduce air resistance.

Through the attention that is being given to research, it may be definitely stated that the industries of the United States have

an advantage of inestimable value over their forebears in corresponding periods of former business depressions. As the tide of business recovery carries us on to better times, the results of American inventive genius are bound to become increasingly felt by all of us, in new products, better products, and products that can be produced so efficiently as to be within the means of all of our people. In short, it is research that will continue to raise the American standard of living to heights it has never attained before.

Technocracy of 1835 Answered

"AT THE BEGINNING of the reign of George III (in 1760) probably not more than forty thousand persons were supported by the whole cotton manufacture: machines have been invented, which enable one man to produce as much yarn as two hundred and fifty or three hundred men could have produced then,—which enable one man and one boy to print as many goods as a hundred men and a hundred boys could have printed formerly: and the effect has been, that now the manufacture supports fifteen hundred thousand persons, or upwards of thirty-seven times as many as at the former period! Yet so profoundly ignorant, or so blindly prejudiced, are some men, even authors and members of parliament, that they still publish solemn lamentations over the growth of machinery! It might have been supposed, that the history of the cotton manufacture would have forever put an end to the complaints against machinery, except on the part of the workmen who were immediately suffering, as some generally will for a time, from the changes in manufacturing processes. The 150,000 workmen in the spinning mills produce as much yarn as could have been produced by 40,000,000 with the one-thread wheel; yet there are those who look on it as a calamity that human labour has been rendered so productive! These persons seem to cherish secretly the preposterous notion, that, without machinery, we should have had as many hands employed in the manufacture, as it would require to produce the present quantity of goods by the old processes; not considering that the population of all Europe would have been quite inadequate to such a purpose; and that, in reality, not one-fifth part of those now employed as spinners ever would have been employed under the old system, because there would have been little or no increased demand for the coarse and high-priced goods then made. If a spinner now can produce as much in a day as he could last century have produced in a year, and if goods which formerly required eight months to bleach, are now bleached in two days, surely these are the very causes of the amazing extension of the manufacture, and are therefore subjects of rejoicing, not of lamentation." From "History of the Cotton Manufacture," by Edward Baines, Jr., published in London, Eng., 1835.

William Franklin Edwards

IN THE DEATH of William Franklin Edwards the textile industry has lost one of its ablest seekers of new scientific knowledge, and one who envisioned clearly the need and value of scientific and economic textile research. As vice-president of Textile Research Council, one of the predecessors of U. S. Institute, as a member of the organization committee of the latter, and, later, as a director and member of its research committee, he was an important factor during the formative period of this movement and until sickness obliged him to curtail his activities. He had been director of research at the United States Testing Co., Inc., for the last twelve years, and a former chairman of Committee D-13 of the American Society for Testing Materials.

Born on a farm near Grand Rapids, Mich., 77 years ago he received his B.S. degree from the University of Michigan and became a member of its faculty. In 1895 he went to the University of Washington as professor of physics and became its president two years later. During the World War he directed research work in Detroit, and since then had been continuously engaged in textile research. He enriched textile research literature with papers and articles in the *Trade Press,* largely on silk and testing methods. His address at the spring meeting in 1929 of Textile Research Council, entitled "The Why and Whither of Scientific Research," is an interesting exposition of his views on the subject.* Mr. Edwards died the morning of January 12th at his home in Englewood, N. J. He is survived by a daughter, Mrs. E. L. Freeman of Detroit, Mich.

* This has been published in booklet form and copies may be had by addressing Secretary, U. S. Institute for Textile Research, 65 Franklin St., Boston, Mass.

Abstracts and Bibliography

This section is compiled under the direction of the Committee on Abstracts and Bibliography: Prof. E. R. Schwarz, Chairman, Dr. W. E. Emley, Mr. E. D. Walen, Prof. Louis A. Olney.

The Arrangement

Abstracts and Bibliography are arranged alphabetically by major subject under the following classifications:

I. Fibres (Synthetic and Natural) and Fibre Analysis.

II. Yarns and Fabrics.

III. Chemical and Other Processing (Not Otherwise Classified).

IV. Research Methods and Apparatus.

V. Economic Research and Miscellany.

Subjects are followed by name of author, and the abbreviated or complete title of the publication is followed by the year, volume, issue number or date, and the page number or numbers.

A key to abbreviations of publications abstracted was published in Vol. III, No. 1, Nov., 1932, pp. 58–9, and should be preserved for reference as it will not be published again in this volume. Abbreviations of additional publications abstracted will be published in issues of their initial use.

Abstracts

I. Fibres (Synthetic and Natural) and Fibre Analysis

Bagasse Cellulose. D. F. Lynch and M. J. Goss. *J. Ind. & Eng. Chem.*, Nov., 1932, P. 1249.

An analytical study of the variety of bagasse available is made to determine some commercial use for the by-product. The comparatively high crude-fiber content would indicate that bagasse may be used as a source for cellulose. The optimum conditions are determined for the production of cellulose from bagasse by the soda method, the sulfate method, and the neutral sulfite method. Experiments indicate that by rigid control of conditions slightly higher yields of cellulose can be obtained than those previously reported. The neutral sulfite digestion gives slightly higher yield than the other methods tested. Because of the poor recovery of the cellulose present in the bagasse, a study of the nitric acid pulping process is made with this by-product. Under the optimum conditions higher yields and better cellulose are obtained with this process. Owing to the obvious advantages of this process and the probability of cheap nitric acid from the oxidation of ammonia, there are indicated commercial possibilities of using the yearly supply of 250,000 to 500,000 tons of bagasse as a source for a-cellulose. (S)

Cellulose and Cellulose Acetates: The Sorption of Alcohol Vapors by. S. E. Sheppard and P. T. Newsome. *J. Phys. Chem.*, Aug., 1932, P. 2306.

The paper deals with the sorption equilibria of various alcohols with cellulose and cellulose acetates, and the rates of adsorption and desorption of alcohols by cellulose and cellulose acetates under definite conditions. It also deals with deductions regarding the sorption process and the fine and coarse structure of cellulose materials. The authors summarize their results as follows: "The rates of adsorption of the normal saturated alcohols up to n-octyl by cellulose and a series of primary and secondary cellulose acetates were determined at the saturation pressures at 30° C. The rates of adsorption and desorption of methyl, ethyl, n-propyl and n-butyl alcohols by a certain cellulose acetate sheet were determined at 30° C., as well as a complete isotherm of the adsorption of ethyl alcohol by the same material at 30° C.

"Alcohol adsorption by primary acetates increases with increasing acetyl content and n-propyl and n-butyl alcohols give maxima at 32% acetyl. Secondary acetates show greater adsorbing power than primary acetates. In general, high alcohols are found to be adsorbed and desorbed more slowly than the lower alcohols. Also, higher alcohols are adsorbed more slowly by cellulose acetate in sheet form than in precipitated form. It is found that the adsorption of different alcohols expressed in moles per gram of cellulose material decreases rapidly with increasing number of carbon atoms and becomes approximately constant at n-butyl." (S)

LIGNIN AND CARBOHYDRATES OF WOOD: POTENTIAL REDUCING NUMBERS OF. *J. Ind. & Eng. Chem.*, Nov., 1932, P. 1283.

The potential reducing properties of lignin and carbohydrates in wood are studied to determine whether they are affected by the treatments employed to isolate the lignin and the cellulose. It is found that hydrolyzed solutions of spruce and catalpa lignins have reducing numbers which are 29.5 and 38.6 per cent, respectively, of that of glucose. (S)

MEDULLATED FIBRE IN NEW ZEALAND ROMNEY FLEECES: DETECTION AND ESTIMATION OF. B. L. Elphick. *J. T. I.*, Dec., 1932, P. T367.

Work done under the auspices of Wool Industries Research Association, reporting further work by means of benzol test already described in J. T. I. The work deals also with certain conditions affecting the growth of persistent hairy fibres as distinguished from kemp, and a very marked correlation of the rate of growth with both the diameter and degree of medullation of the fibres is noted. Studies are also included which were made throughout various fleeces, and diagrams are given to show the location of the samples and the result. Developments in the technique of fleece sampling are described and twelve references are given most of which are from the *New Zealand Journal of Agriculture.* (S)

PLANT FIBRES: ON THE DIVIDED STRUCTURE OF. A. P. Sakostschikoff. *Mell. Textilber.*, Oct., 1932, P. 517.

A brief article, following two others published in 1930 in this same journal, relating to the determination of the structural details of fibre. The author outlines two methods of treatment: one with concentrated sulphuric acid, glycerin, or alcohol; the other by means of the chlorzine-iodine staining reaction. Use of the microscope with a drawing apparatus (camera lucida) to record the structural details (cross-wise markings) is outlined together with the treatment of the data. The author measures the percent. of cross markings which completely penetrate the fibre, the percent. found only on one side of the fibre, the percent. perpendicular to the axis of the fibre and the percent. at angles other than 90° to the axis. Work is reported on eight types of cotton together with several other fibres. (S)

VISCOSE ARTIFICIAL SILK: INFLUENCE OF THE SPINNING BATH UPON THE QUALITY OF. H. Pincass. *Mell. Textilber. (Engl. Ed.)*, 1932, 13, 84.

The bath must be of such a nature that the regeneration of the cellulose takes place continuously, uniformly, and completely. Excess of sodium sulphate causes the cross-section of the fibre to flatten; an insufficient amount results in under-coagulation. Zinc sulphate helps to make the thread round. Glucose improves the handle and strength of the silk; it slows down the spinning process, protecting the cellulose from decomposing too far and the bath from crystallising out. Magnesium sulphate makes the silk more elastic, stronger, and of a softer handle. The spinning liquor should contain at least 5 SO_4 ions for every 3 H ions. For unripened viscose, dilute solutions of acids and inorganic salts, together with sulphonated organic compounds, are used. These organic bodies retard coagulation. Matt lustre can be produced by the addition of hydroquinone to the bath. (Copied complete from abstract section of *J. Soc. Dyers and Col.*, Oct., 1932.) (S)

II. Yarns and Fabrics

Aromatics Find Increasing Use for Reodorizing Textiles. Anon. *Tex. Wld.*, Dec., 1932, P. 81.

Describes aromatics found suitable for perfuming and reodorizing textiles, methods of their application, and amounts of aromatics required. Expresses the opinion that there seems little likelihood of any great consumer demand for highly perfumed textiles, but that reodorizing of textiles having unpleasant odors is likely to become standard practice. (C)

Artificial Silk Yarn Standardisation. H. Iselin. *Rayon Record*, 1932, 6, P. 256.

The 1932 Rules, issued by the *Bureau International pour la Standardisation des Fibres Artificielles*, contain a number of additions as compared with 1931. The new Rules concern the differentiation of artificial silk from natural silk and cotton, and between the various artificial silks; the determination of the count, tensile strength, extension and twist of viscose and cuprammonium silks which have been oiled or sized, and have a greater twist than 400 turns per metre; the determination of the strength and twist of sized cellulose acetate silk with less twist than 400 turns per metre. Conditioning for 24 hours is now only prescribed for strength tests; for the determination of count a short conditioning is considered to be sufficient. In strength determinations the thread must be given the necessary tension by a suspended weight, and the angle of the loading lever from the perpendicular must not exceed 45°. In twist determinations, tensioning must be effected by a suspended weight. A variation of $\pm$ 1% for viscose and cuprammonium yarns from the fixed 11% moisture regain is allowed. Tests within the scope of the Rules have to be carried out within 30 days after receipt of the goods. The new Rules represent satisfactory progress towards the standardisation of the testing regulations for artificial silk. (Copied complete from abstract section of *J. Soc. Dyers and Col.*, Oct., 1932.) (S)

Break Draft: A Neglected Detail of Cotton Spinning. Alfred K. Landau. *Tex. Wld.*, Dec., 1932, P. 77.

It has been proved that roving of medium weight can be stretched as much as 2% without any positive displacement of its fibres. Therefore, the old standard break-draft of approximately 1.08 is insufficient to remove the roving twist and unlock the fibres for effective drafting. To obtain the best results a difference in surface speed between back and middle rolls ranging from 1.1 to 1.3 is necessary; furthermore, back and middle rolls must be in as good condition as front rolls to prevent roll slipping, or pulling through of roving. The author admits that limited space prohibits discussion of all phases of the subject, and this accounts probably for his failure to suggest maximum break-drafts for various cottons and rovings, and methods by which minimum roving twists may be made possible without danger of fibre displacement between the roving bobbin and the back roll of the spinning frame. (C)

Long-Draft in Roving and Single vs. Double Roving in Spinning. J. L. Truslow. *Tex. Wld.*, Nov., 1932, P. 72–4.

A paper, based upon practical experience, that was delivered at meeting of Textile Division of A. S. M. E., Oct. 19, 1932. Is mainly descrip-

tive of various mill organizations for long-draft spinning of coarse to fine counts, with particular emphasis upon some that are using single roving. The key to the successful use of single roving, the author says, "is in the preparation. If a mill is going to cut corners on doublings, everything from the last process of roving back to the bale breakers must be just right." With these conditions fulfilled one card-room process can be eliminated.

While the author describes a long-draft system for the card-room and states that it has been proved workable, he admits that it is a pioneering project, and that unforeseen difficulties may be encountered and further improvements required. (C)

SPINNING TESTS ON COTTONS. *Tex. Mfr.*, Oct., 1932, P. 382.

An outline of new standard cotton spinning mill tests and their significance based on an excellent account, to be found in the Empire Cotton Review, of work carried out on behalf of the Empire Cotton Growing Corporation by the Shirley Institute. The following fibre-test qualities are briefly outlined: effective length, percentage dispersion, percentage short fibre, fibre-weight per centimetre, immaturity, counts, twist factor, yarn strength, work of rupture (skein test), count-strength product, count-work product, yarn appearance, ends down in spinning, and winding tests. (S)

WORSTED YARNS MADE FROM SHORT WOOLS, NOILS AND WASTES: A PSYCHO-TECHNICAL INVESTIGATION OF. Henry Binns. *J. T. I.*, Dec., 1932, P. T394.

A discussion of comparative tests of new yarn and fabric, developed by Dr. Midgley of Bradford Technical College, for handle were made by five manufacturers, five male retail buyers, five female retail buyers, five male consumers, five female consumers, five ten- to eleven-year-old boys, five ten- to eleven-year-old girls and five by the author by means of touch alone. In general the conclusions favored the material made up of short wools by the new method. (S)

III. CHEMICAL AND OTHER PROCESSING (NOT OTHERWISE CLASSIFIED)

ACID DEGUMMING FOR SILK-WOOL UNIONS. H. H. Mosher. *Tex. Wld.*, Dec., 1932, P. 78–9.

Having shown (*Tex. Wld.*, Nov., 1932, P. 86–7) that the drastic alkaline boil-off usually employed in silk degumming proves harmful to silk-wool unions, and suggesting that superior results should attend its modification, or the utilization of acids for partial or complete degumming, the author in this article presents results of tests showing the influence of time, temperature, and the pH of the scouring liquor on the tensile strength, color, and dyeing properties of the wool. The data indicate that acids may be used advantageously in effecting either complete or partial gum removal, and the development and results of such a method are to be reported by the author later. (C)

COLOR AS A TRANSFORMER OF ENERGY. *Am. Dye. Rptr.*, Nov. 7, 1932, P. 638.

This paper, because of its treatment of the subject and interest, was translated from *Tiba* (July, 1932), by A. Papineau-Coutere.

The author concludes that color is merely a transformer of energy, of wave-length. When a ray penetrates into the molecules at the surface of a body, part of its energy is transmitted without change in the wave-length, while the remainder is changed to a greater or less extent. The change which takes place always increases the wave-length, as though the molecules, by a viscosity effect, tended to retard the rays. This produces heat, fluorescence and also phosphorescence, which is intimately related to the first two as it is really a retarded fluorescence.

The phenomenon evidently extends beyond the limits of the visible spectrum which constitutes but a small portion of the total transmission spectrum. And in order to predict its effects, it is essential to study color in the invisible spectrum, at least in those portions bordering on the visible spectrum, and it is here that color should be studied by means of the photo-electric cell in order to determine and understand its laws. (S)

DEGUMMING ACTION OF SOAP ON RAW SILK. PART II. Risaku Tsunokaye. *J. Soc. Dyers & Col.*, Oct., 1932, P. 280.

A continuation of a previous paper in the same journal, 1932, volume 48, P. 164 (abstracted in the *T. R. I. Bull.*, Sept., 1932). In degumming silk with soap there remains about 1% of soap and its hydrolysis products, alkali and fatty acids, combined physically and/or chemically with the fibre, causing certain modifications in the properties of the silk.

Alkali diminishes the lustre, strength, and elasticity of degummed silk. Fatty acids increase the elasticity of the silk. Soaps from unsaturated fatty acids or oils retain a better lustre on the silk than when soaps produced from saturated fatty acids are employed, but, on the other hand, saturated fatty acids are without influence upon the color, whereas unsaturated fatty acids may be responsible for color deterioration as they undergo oxidation changes. Absorbed soap is less liable to such oxidation. Fatty acids have but slight influence on the weighting process. (S)

ENZYMES IN THE TEXTILE INDUSTRY. B. S. Hillman. *Tex. Mfr.*, Oct., 1932, P. 412.

Recent work has defined the conditions for use of enzymes particularly in the degumming of silk, and of silk with acetate or wool mixtures. A brief account of the nature and source of enzymes is given with the techniques of their use. The article is reprinted from the *Textile Colorist* and the reader's attention is drawn to a brief article appearing in the *Textile Manufacturer* for July, 1932. (S)

FASTNESS TO FULLING OF DYED WOOL: DEVELOPMENT OF A LABORATORY METHOD FOR TESTING THE. Bertil A. Rybert. *Am. Dye. Rptr.*, Nov. 21, 1932, P. 662; *Lowell (Mass.) Textile Institute Bull.*, Series 36, No. 2, Nov., 1932.

The paper describes a laboratory method which is not only easily carried out but which has been pronounced more reliable and readily duplicable than any other laboratory or practical mill method. Work was done by an A. A. T. C. C. Research Associate under the direction of the sub-committee on fastness and dyed wool and was made possible by a grant from the Textile Foundation. (S)

IV. Research Methods and Apparatus

Apparatus for Scouring Small Samples of Wool and a Modified Apparatus for Determining Dry Weights. W. C. Miller and D. M. Bryant. *J. T. I.*, Nov., 1932, P. T267.

Apparatuses for scouring and for drying small laboratory samples of wool for general purposes are described. The scouring apparatus devised has advantages in that a number of samples may be treated by standard scouring methods simultaneously and under constant conditions of temperature and agitation. Loss of fibres is avoided by using wire gauze containers of fine mesh. The drying apparatus, which employs a current of hot air dried by a method essentially the same as that used by other workers, possesses the following improvements: (a) Eight samples can be brought to constant weight without interruption; (b) connections between the sample-containers (modified U-tubes) and the drying apparatus are made by mercury seals, which render removal for weighing and replacement rapid and easy; (c) the detection of the gross moisture content of the issuing air current, firstly by a condensing indicator and subsequently by the changes in weight shown by a $CaCl_2$ drying tube, avoids the necessity for many preliminary weighings. (S)

Controlled Temperature and Humidity Room for Textile Testing at the University College, Nottingham. C. H. Edwards. *J. T. I.*, Nov., 1932, P. T274.

A description of a system for controlling atmospheric conditions in the laboratory capable of bringing the relative humidity down from 78 to 65% in 70 min. Calcium chloride is used and an average of 1,500 pounds per year would be required. The room conditioned is 18 x 8 x 17 feet with the two long walls double (3 inches air space). The volume of the room is 2,448 cubic feet and the room is equipped with an air lock for exit and entrance; automatic temperature and humidity control is provided. (S)

Fastness of Dyes: A New Method for the Determination of. J. Pinte and R. Toussaint. *Mell. Textilber.*, Nov., 1932, P. 596.

A description with the resultant data in the field of spectro-photometric diagrams of a photo-colorimeter. Light of six wave lengths (400, 450, 530, 580, 620, and 700), obtained by means of a series of filters, is reflected from the surface to be examined on to a photo-electric cell. This latter is in series with a 160 volt battery, rheostat and galvanometer. Readings of the latter are made with the usual mirror and scale. The article is to be continued. (S)

Rayon and Cotton Yarns: Tensile Strength and Fluidity in Cuprammonium Hydroxide Solution of Chemically Modified. B. P. Ridge and H. Bowden. *J. T. I.*, Dec., 1932, P. T319.

The first part of work on this general problem is reported as studies of oxidation by hypochlorite solutions. After an introduction and survey of results of previous work, the authors continue with a detailed description of the experimental procedure and with a lengthy discussion of the results including numerous tables and charts and an initial bibliography of thirteen items. (S)

Bibliography

I. Fibres (Synthetic and Natural) and Fibre Analysis

Cellulose Derivatives at Various Temperatures: The Modulus of Elasticity of. E. Valko. *Mell. Textilber.*, Sept., 1932, P. 461.

Test results on a number of celluloid and cellulose derivatives are given as obtained on the Polanyi strength tester, a picture of which is given. (S)

Bamboo Cellulose: Moisture Adsorption. S. Oguri. *J. Soc. Chem. Ind., Japan (Suppl.)* 1932, 35, 239B–244B.

Apparatus for moisture adsorption measurements is shown diagrammatically. Adsorption isotherms and isohygrometric curves are given for bamboo celluloses and compared with those of cotton cellulose. (Copied complete from *J. T. I.* Abstract Section, Nov., 1932.) (S)

Cotton Classing and Grading at the Mill: Importance of. H. H. Willis. *Cotton*, Dec., 1932, P. 28.

This article points out the importance of proper classing and grading by the mill's cotton man, and, therefore, the importance and value of a good cotton man. It also gives in a clear manner a description of grade, length, strength and uniformity of staple, and character, and the several elements of each of these factors. (S)

Cottonseed: Anatomy and Microchemistry. R. G. Reeves and C. C. Valle. *Brit. Chem. Abs.*, A, 1932, 784 (from *Bot. Gaz.*, 1932, 93, 258–77). (S)

Fibres: Capillary Appearances of. Karl Schultze. *Mell. Textilber.*, Oct., 1932, P. 544.

A discussion of the relationships of the cross-section shape of the fibre and its properties, particularly as they affect the finished fabric. (S)

Raw Silk: Physical Properties of. I. Density and Modulus of Elasticity. II. Coefficient of Thermal Expansion. J. Kubota. *Bull. Sericult, Japan*, 1932, 5, 9–10, from *Brit. Chem. Abs.*, 1932, B, 976.

The modulus of elasticity is 115×10^6 g. per sq. cm., and the coefficient of linear expansion 98×10^{-7}. (Copied complete from *J. T. I.* Abstract Section, Dec., 1932.) (S)

Raw Silk Fibre of Domestic Cocoon: Natural Pigments of. III. Melting Point of Cocoon Zanthophyll. M. Oku. *J. Agric. Chem. Soc. Japan*, 1932, 8, 655–658; *Bull. Agric. Chem. Soc. Japan*, 1932, 8, 7–8; from *Chem. Abs.*, 1932, 26, 5212.

The melting point, 193° (corrected), is identical with that of Kuhn's lutein. (Copied complete from *J. T. I.* Abstract Section, Dec., 1932.) (S)

II. Yarns and Fabrics

Anti-Crease Process of Finishing Fabrics: The Tootal. *Tex. Mfr.*, Sept., 1932, P. 349.

Further details are given of the anti-crease finish of cotton, rayon, linen and other fabrics. (S)

Black Carpet Beetle. Noel D. White. *Am. Dye. Rptr.*, Dec. 5, 1932, P. 683.

Damage to silk fibre both in the raw and finished materials was traced to the same kind of beetle which damages carpets, upholstery, feathers, hair mattresses and the like. (S)

French Comb is Practical for Long Wools. L. M. Harless. *Tex. Wld.*, Nov., 1932, P. 66.

The author writes: "Other machines may be more productive on long wools, but the new and wider French combs are capable of competing with them, not from the unit-machine basis but from the floor space and operative-unit production." Preparation for the new French comb and its proper operation are explained, and a table is given showing influence of feeding and tearing on production, based on 100 nips a minute. (C)

Latex Processed Rope. *Rubber Age*, Aug. 10, 1932, P. 362.

New type of cordage claimed to possess better waterproofing qualities and reduction in wear through improved lubrication of the fibres. Vulcanization of the rope does not destroy proper flexing properties. (S)

Licker-In Speed: Its Effect on Card Waste, Sliver and Yarn. Horace Spibey. *Tex. Wld.*, Dec., 1932, P. 74–5.

Abstract of "Taker-In Speeds on Different Card Wastes, Sliver and Yarn: the Effects of Different." Horace Spibey. *J. T. I.*, Sept., 1932, P. T183. (See *Tex. Rsch.*, Vol. III, No. 2, P. 135.) (C)

III. Chemical and Other Processing (Not Otherwise Classified)

Aspergilli: Cultural Studies. J. C. Eyre. *Ann. Appl. Biol.*, 1932, 19, 351–69. (S)

Cotton Bleaching: Latest Research Work on. *Am. Dye. Rptr.*, Nov. 7, 1932, P. 647.

A brief paper presented to the Philadelphia Section, American Association of Textile Chemists and Colorists, Sept. 30, 1932. (S)

FADING OF DYES ON COTTON AND ON CELLOPHANE. Eva Hibbert. *J. Soc. Dyers & Col.*, Sept., 1932, P. 251.

A brief discussion of the fading of certain dyes on cotton and on cellophane together with the action of cellophane as protective film for certain dyed cottons. (S)

MERCERIZED COTTON: ON THE ABSORPTION CHARACTERISTICS OF. Karl Schwertassek. *Mell. Textilber.*, Oct., 1932, P. 536.

The work is concerned largely with the effect of temperature upon the iodine absorption, although mention is made of the effect of chlorine bleach and drying. (S)

IV. RESEARCH METHODS AND APPARATUS

NEW MICROSCOPE SHOWS TEXTILES AS THEY ARE. Edward R. Schwarz. *Tex. Wld.*, Dec., 1932, P. 84.

For the examination of fibers and yarns, and as an aid in the analysis and synthesis of fabrics, the microscope is almost indispensable. In the following article, which is abstracted from a paper read in Cambridge, Mass., at a meeting of the textile section, American Society of Mechanical Engineers, Professor Schwarz discusses some of the more recent improvements in this instrument and other microscopical equipment. (S)

OPAQUE MICROSCOPY: DEVELOPMENT OF. Dr. Karl Albrecht. *Optische Rundschau*, June 1, 1932, P. 336.

A brief historical summary is given of the development of opaque microscopy. Certain methods of vertical illumination and of dark-field illumination are illustrated. (Copied complete from *B. & L. Abs. Bull.*, Dec., 1932.) (S)

PARAFFIN WAXES, STEARINE AND SIMILAR SUBSTANCES: EXAMINATION OF. F. S. Dangl. *Mell. Tex. Mo.*, Sept., 1932, P. 368.

The use of the polarizing microscope is described in the identification of various waxes. The use of this instrument provides a very accurate means for determining melting point. The use of a photo-electric cell in conjunction with the polarizing microscope is suggested as a means of automatically registering melting point and solidifying point. A patent application has been filed on this latter combination. (Copied complete from *B. & L. Abs. Bull.*, Dec., 1932.) (S)

MICROTOME: APPLICATION. J. Kisser. *Abderhalden's Handbuch der Biologischen Arbeitsmethoden*, Abt. XI Teil 4, pp. 391–738, 1932.

An exhaustive review of methods for preparing sections for examination under the microscope. (Copied complete from *J. T. I.* Abstract Section, Nov., 1932.) (S)